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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/687,112	10/15/2003	Bioh Kim	SEMT116964	7221

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EXAMINER

TALBOT, BRIAN K

ART UNIT	PAPER NUMBER
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1762

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/02/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/687,112

Applicant(s)

KIM, BIOH

Examiner

Brian K. Talbot

Art Unit

1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 2/26/07 (election).
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-41 is/are pending in the application.
- 4a) Of the above claim(s) 27-41 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>3/12/04; 8/3/04</u> | 6) <input type="checkbox"/> Other: _____ |

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-26, drawn to process of forming a solder alloy precursor, classified in class 427, subclass 96.1+.
 - II. Claims 27-41, drawn to a tool for forming the solder alloy, classified in class 118, subclass 504.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another and materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the process as claimed can be practiced by another and materially different apparatus or by hand.
3. Because these inventions are independent or distinct for the reasons given above and there would be a serious burden on the examiner if restriction is not required because the inventions have acquired a separate status in the art in view of their different classification, restriction for examination purposes as indicated is proper.
4. During a telephone conversation with Jeffrey Sakoi on 2/26/07 a provisional election was made without traverse to prosecute the invention of Group I, claims 1-26. Affirmation of this election must be made by applicant in replying to this Office action. Claims 27-41 have been withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Art Unit: 1762

5. Hence, claims 1-26 are presently active in the application for prosecution while claims 27-41 are withdrawn as being directed toward a non-elected invention as detailed above. The non-elected claims, 27-41, should be canceled in response to this Office Action.

Specification

6. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

No claims directed to the tool are active in the application. In addition, Title directed to “precursors”, however, the claims are not.

Claim Rejections - 35 USC § 112

7. Claims 1-26 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for electrolytic coating/plating, does not reasonably provide enablement for other forms of coating/plating such as immersion, electroless, spraying, laminating, etc.. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention commensurate in scope with these claims.

The specification, pg. 1, lines 3-5 and pg. 4, lines 14-15, clearly define the plating/coating to be electrolytic.

Art Unit: 1762

8. Claims 1-26 are rejected under 35 U.S.C. 112, first paragraph, as based on a disclosure which is not enabling. The formation of a patterned mask atop the barrier layer prior to forming the multiple conductive layers as well as the reflowing of the two conductive layers to form the solder bump are critical or essential to the practice of the invention, but not included in the claim(s) is not enabled by the disclosure. See *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976). (see Figs and pg. 5, lines 9-12).

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 3,5,8,12,13,15,17,18,20,22,25 and 26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claims recite improper Markush terminology. Applicant is reminded when claiming a group of items the phrase “selected from the group consisting of” should precede the grouping and the last item should be preceded by and “and” not an “or”.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Art Unit: 1762

Claims 11-13 and 15-26 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Hur et al. (6,013,572).

Hur et al. (6,013,572) teaches a method of fabricating and testing silver-tin alloy solder bumps. A masked underbump metallurgy layer on a microelectronic substrate defining exposed portions of the underbump metallurgy layer is plated with silver, then plated with tin and then reflowed to form the silver-tin alloy bump (abstract and col. 1, line 55 – col. 2, line 12). The silver and tin layers are applied by electroplating (col. 2, lines 28-42). In another embodiment, two layers of silver and plated followed by a layer of tin and reflowing is performed (col. 2, lines 53-62). The first underbump metallurgy layer is Ti, Cr or TiW. The second underbump metallurgy layer is copper or nickel (col. 2, lines 19-27). The tin layer can comprise an alloy such as silver-tin (col. 3, lines 1-3). The first underbump layer is considered a barrier layer by the Examiner as it comprises Cr, Ti or TiW which are conventional barrier/diffusion layers in the art.

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 1762

Claims 1-10 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over in Hur et al. (6,013,572) combination with Mitchell et al. (5,773,359).

Features described above concerning Hur et al. (6,013,572) are incorporated here.

Hur et al. (6,013,572) fails to teach forming a diffusion barrier layer on the UBM layer underneath the solder material.

Mitchell et al. (5,773,359) teaches an interconnect system and method of fabricating a solder bump is formed on a semiconductor substrate whereby UBM is formed as a tri-layer comprising a bottom barrier layer (26) and two copper layer (27,28). The barrier layer (26) is preferable titanium but other materials can be used including nickel. The barrier layer (26) functions to prevent diffusion of the copper and/or solder layer from penetrating the metal layer (23) on the substrate. In addition, the solder layer (29) comprises tin and lead but the lead can be replaced by bismuth or indium. The solder layer (29) can be applied by electroplating (col. 1, line 48 – col. 3, line 55).

Therefore it would have been obvious for one skilled in the art at the time the invention was made to have modified Hur et al. (6,013,572) solder bump process by incorporating a barrier/diffusion layer above the UBM layer and beneath the solder material as evidenced by Mitchell et al. (5,773,359) with the benefits associated with such a layer as detailed above.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian K. Talbot whose telephone number is (571) 272-1428. The examiner can normally be reached on Monday-Friday 8AM-4PM.

Art Unit: 1762

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy H. Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

BKTalbot 2/27/07
Brian K Talbot
Primary Examiner
Art Unit 1762

BKT